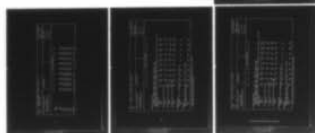
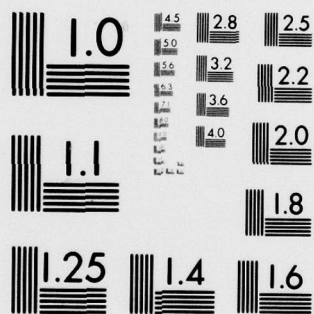


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USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK
Volume 143
F-105D In-Flight Crew Noise *AD 80910*

AUGUST 1979

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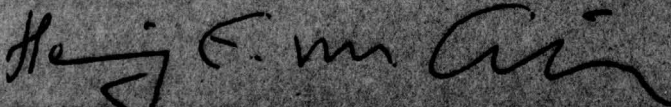
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FOR THE COMMANDER



HENNING E. VON GIERKE

Director

Biodynamics and Bioengineering Division

Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The F-105D is a USAF all-weather fighter-bomber. This report provides measured data defining the bioacoustic environments at the pilot's location inside this aircraft for 19 conditions. Data are reported for one location in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times		

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✓ for total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application," AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723108, Crew Safety In Operational Noise Environments.

The author acknowledges the efforts of Mr. John N. Cole who established the data analysis requirements, Mr. Henry Mohlman and Mr. Fred Lampley of the University of Dayton who assisted in the mechanics of data processing and Mrs. Peggy Massie who typed this report and prepared it for publication.

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INTRODUCTION

The USAF F-105D is a single seat all-weather fighter-bomber manufactured by the Fairchild Republic Division. Power is provided by one J75-P-19W turbojet engine manufactured by the United Aircraft Corporation, Pratt & Whitney Aircraft Division.

This volume provides measured data defining the bioacoustic environments produced inside the aircraft. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the F-105D aircraft.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and ground support equipment. The far-field, community-type noise data in the handbook describe the noise produced during *ground operations* of aircraft ground support equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. *Refer to Volume 1* (reference 1) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., in-flight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

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1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

IN-FLIGHT NOISE

MEASUREMENTS

All noise measurements were made on-board a F-105D aircraft during typical speed, altitude, and flight maneuver conditions. These levels describe the standard F-105D environments but may not be representative of those levels encountered if the aircraft has been configured differently (e.g., major equipment or structural changes).

Acoustic measurements were made inside the cockpit at the pilot's location. Table 1 lists the measurement location and test conditions as numeric/alphabetic designators which are used on the data pages. The designator 1/A means measurement location 1 and test condition A, etc.

The microphone was attached to the pilot's helmet by means of a lightweight boom. This arrangement enabled adjustment of the microphone close to the ear level at a distance of 0.1 meter with its diaphragm parallel and facing away from the helmet's surface. In the analysis, microphone corrections for random incidence were applied to the overall system response. The recorded samples were analyzed using a four or eight second integration time to obtain a power-averaged level which effectively smooths out short duration fluctuations and best describes the exposure.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced inside the F-105D aircraft at the specified location. This table includes the overall, 1/3 octave band, and octave band levels. From these data, C-weighted and A-weighted sound levels, maximum permissible time for one exposure per day (AFR 161-35) with and without standard Air Force ear protectors, preferred speech interference level, and perceived noise level are calculated and presented in Table 3. These measures are widely used to assess the effects of noise on personnel and their performance.

TABLE 1
MEASUREMENT LOCATIONS AND TEST CONDITIONS
F-105D Carswell AFB, 8 June 1978

<i>Location</i>	<i>Position</i>	<i>Height Above Deck</i>
1	Pilot	Seated Head Level
<i>Condition</i>	<i>Description</i>	
A	Ground Run Up — Engine Idle — Canopy Closed — ECS Off	
B	Ground Run Up — Engine Idle — Canopy Closed — ECS On	
C	Ground Run Up — Engine 100% RPM — Canopy Closed — ECS Off	
D	Ground Run Up — Engine 100% RPM — Canopy Closed — ECS On	
E	Taxi — Engine Idle — Canopy Closed — ECS On	
F	Taxi — Engine Idle — Canopy Open	
G	Takeoff — Engine A/B	
H	Climb To 2500' AGL — Engine A/B Off	
I	Low Altitude High Speed Run — 2000' AGL — 450 KIAS .63 M	
J	Descend 9000' ↘ 3000' PA — Engine Power Mil. — 450 KIAS	
K	Descend 11000' ↘ 3000' PA — Engine Power 88% 450 KIAS	
L	Simulated Dive Bomb Run 9500' — 7500' PA Engine 101% RPM — 450 KIAS	
M	Strafing — Gun Bursts — 8000' ↘ 4500' PA 450 KIAS .58 M	
N	Cruise — 11000' PA — 350 KIAS .63 M Engine 93% RPM	
O	Descend 11000' ↘ 9000' PA — 350 KIAS Engine 91% RPM — ECS Cycled To Remove Ice	
P	Descend 8000' ↘ 3000' PA — 350 KIAS — Engine 90% To Mil.	
Q	GCA Final Approach — 1500' PA — 170 KIAS — Gear And Flaps Down	
R	Touchdown — Landing Roll	
S	Taxi — Engine Idle — Canopy Open	

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:	
2											
1/3 OCTAVE BAND											
NOISE SOURCE/SUBJECT:											
(OPERATION:											
(
F-105D AIRCRAFT											
(
IN-FLIGHT CREW NOISE											
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TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:	
2 1/3 OCTAVE BAND										OMEGA 3.2	
NOISE SOURCE/SUBJECT:										TEST AC-079-001	
(OPERATION:										RUN 02	
(F-105D AIRCRAFT										31 MAY 79	
(IN-FLIGHT CREW NOISE										PAGE F2	
LOCATION/CONDITION											
FREQ (HZ)	1/K	1/L	1/M	1/N	1/O	1/P	1/Q	1/R	1/S		
25	77	77	79	75	76	76	82	84	91		
31.5	75	76	78	73	73	81	81	83	77		
40	76	76	73	74	74	84	82	83	71		
50	80	80	85	78	78	79	91	89	76		
63	84	85	88	81	84	82	92	90	81		
80	90	89	94	87	89	86	94	91	90		
100	94	95	94	93	94	88	92	90	89		
125	91	91	93	91	92	91	94	93	86		
160	94	94	94	91	92	91	96	93	91		
200	95	95	96	94	95	96	97	96	96		
250	92	92	94	92	92	94	95	92	88		
315	95	94	94	92	94	94	96	92	89		
400	95	96	96	94	95	97	97	95	93		
500	97	98	98	96	97	99	99	99	97		
630	98	99	98	95	97	99	100	99	98		
800	96	96	97	95	96	98	95	95	95		
1000	100	100	100	98	98	99	96	95	96		
1250	99	101	99	97	98	98	98	96	98		
1600	100	99	99	99	99	98	98	98	98		
2000	98	96	96	98	97	93	93	92	90		
2500	96	95	94	98	96	92	92	91	89		
3150	99	98	96	100	98	94	95	92	89		
4000	100	98	98	101	99	94	94	91	89		
5000	98	96	95	98	98	92	92	88	85		
6300	101	99	99	101	101	97	94	90	86		
8000	98	95	95	98	98	94	92	89	85		
10000	96	94	94	96	96	94	89	86	82		
OVERALL	111	110	110	110	110	109	109	108	106		

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										
2 OCTAVE BAND										
IDENTIFICATION:										
OMEGA 3.2										
TEST AC-079-001										
RUN 01										
31 MAY 79										
PAGE J1										
NOISE SOURCE/SUBJECT: (OPERATION:										
F-105D AIRCRAFT										
IN-FLIGHT CREW NOISE										
LOCATION/CONDITION										
FREQ (HZ)	1/A	1/B	1/C	1/D	1/E	1/F	1/G	1/H	1/I	1/J
31.5	84	81	87	85	78	98	91	80	81	81
63	88	85	95	93	89	99	97	91	91	91
125	92	92	101	101	92	98	104	98	96	98
250	96	96	100	102	95	101	102	99	100	99
500	97	97	105	106	98	101	103	103	105	103
1000	99	99	102	105	99	110	103	102	106	105
2000	99	100	100	101	94	111	101	102	102	102
4000	95	95	95	101	92	112	101	103	110	102
8000	91	92	96	99	95	111	100	103	99	102
OVERALL	105	105	110	111	104	117	111	110	111	111

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)										IDENTIFICATION:	
2											
NOISE SOURCE/SUBJECT:											
F-105D AIRCRAFT											
IN-FLIGHT CREW NOISE											
OPERATION:											
31 MAY 79											
PAGE J2											
LOCATION/CONDITION											
FREQ (HZ)	1/K	1/L	1/M	1/N	1/O	1/P	1/Q	1/R	1/S		
31.5	81	81	83	79	79	86	86	88	83		
63	91	90	95	88	90	88	97	95	90		
125	98	98	98	96	98	95	99	97	94		
250	99	99	99	97	98	100	101	99	97		
500	102	102	102	100	101	103	103	102	101		
1000	103	104	104	102	102	103	101	100	101		
2000	103	102	101	103	102	100	101	100	99		
4000	104	102	101	104	103	98	98	95	93		
8000	104	101	101	104	103	100	97	93	89		
OVERALL	111	110	110	110	110	109	109	108	106		

TABLE: MEASURES OF HUMAN NOISE EXPOSURE											IDENTIFICATION:
3											
NOISE SOURCE/SUBJECT: (OPERATION:)											
F-105D AIRCRAFT ()											
IN-FLIGHT CREW NOISE ()											
PAGE H1											
HAZARD/PROTECTION											
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR											
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR											
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)											
NO PROTECTION											
OASLC											
OASLA											
T											
HGU-2A/P HELMET WITH H-154											
OASLA*											
T											
HGU-2A/P HELMET WITH H-154(A)											
OASLA*											
T											
HGU-2A/P HELMET WITH CUSTOM LINER											
OASLA*											
T											
COMMUNICATION											
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)											
PSIL											
ANNOYANCE											
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)											
TONE CORRECTION (C IN DB)											
PNLT											
C											
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.											
P ADDITIONAL EAR PROTECTION REQUIRED.											

TABLE: MEASURES OF HUMAN NOISE EXPOSURE										IDENTIFICATION:	
3										OMEGA 3.2	
										TEST AC-079-001	
NOISE SOURCE/SUBJECT: (OPERATION:)										PUN 02	
F-105D AIRCRAFT ()										31 MAY 79	
IN-FLIGHT CREW NOISE ()										PAGE H2	

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.